First Annual Report

CALFED Ecosystem Restoration Program
Contract #01-N25

"SUSTAINING AGRICULTURE & WILDLIFE BEYOND THE RIPARIAN CORRIDOR"

Also known as

The Lower Union School Slough Watershed Improvement Program
Yolo County Resource Conservation District (RCD)

Submitted to:

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Yolo County Resource Conservation District (RCD)
"SUSTAINING AGRICULTURE & WILDLIFE BEYOND THE RIPARIAN CORRIDOR"
(The Lower Union School Slough Watershed Improvement Program)
CalFed Ecosystem Restoration Program contract #01-N25

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CALFED Project #: 01-N25
Quarter Ending: September 30, 2002

Deliverables

Task	Name of Deliverable	Due Date	% Complete	Date Complete
1	**First Year Fall/Winter Watershed Monitoring and Demonstration Projects**	**April 10, 2002**	**100%**	**April 10, 2002**
1.1	Draft and final QAPP and Monitoring Plan	April 10, 2002	100%	April 10, 2002
1.2	Sections of quarterly programmatic reports related to demonstration and monitoring activities	January 10 and April 10, 2002	100%	January 10 and April 10, 2002
2	**First Year OnePlan Development**	**October 10, 2002**	**100%**	**October 10, 2002**
2.1	Sections of quarterly and Annual programmatic reports related to OnePlan development	End of each quarter through year 1	100%	January 10, April 10, July, 2002
3	**First Year Fall/Winter Season Program Management and Communications**	**April 10, 2002**	**100%**	**April 10, 2002**
3.1	Draft and final subcontract agreements for research, assessment and monitoring activities and OnePlan development	April 10, 2002	100%	April 10, 2002
3.2	Sections of quarterly programmatic reports related to	January 10 and April 10, 2002	100%	January 10 and April 10, 2002

	Program management and communication			
3.3	Letters of intent from Cost Share Partners	April 10, 2002	100%	April 10, 2002
4	**First Year Spring/Summer Watershed Assessment and Demonstration Projects**	**October 10, 2002**	**100%**	**October 10, 2002**
4.1	Sections of quarterly and annual programmatic reports related to demonstration and monitoring activities	July 10 and October 10, 2002	100%	July 10 and October 10, 2002
5	**First Year Spring/Summer Program Management and Communication**	**October 10, 2002**	**100%**	**October 10, 2002**
5.1	Sections of quarterly and annual programmatic reports related to Program management and communication	July 10 and October 10, 2002	100%	July 10 and October 10, 2002
5.2	A verbal or written presentation on an annual basis, as required	October 10, 2002	100%	October 10, 2002

Introduction

The Lower Union School Slough Watershed is located in the lowland portion of Yolo County where the predominant land use is row-crop agriculture. It is the lower portion of a watershed that extends into the Coast Range Mountains to an elevation of over 2,200 ft. The primary land use in the lower watershed is field and row-crop agriculture. The Yolo County Resource Conservation District (RCD), through The Lower Union School Slough Watershed Improvement Program (LUSSWIP), aims to address the concerns of loss of bio-diversity, loss of quality wildlife habitat related to conventional agricultural land management, and degradation of water quality due to sediment and nutrient loading, all in a way that supports a healthy agriculture. This program addresses these issues in a number of innovative ways that will ultimately be transferable to many other similar areas. We have begun work on a watershed-wide as well as site-specific monitoring program whose goal is to develop simplified methods of watershed assessment; landowner conservation and education projects; and a web-based conservation planning tool that will put state-of-the-art conservation planning in the hands of those with the most intimate knowledge of the land – private landowners.

The LUSSWIP is funded through the CALFED Ecosystem Restoration Program. It is a continuation of the CALFED funded (1999) Audubon-California and RCD Union School Slough

Watershed Improvement Program (USSWIP). The upper portion of the watershed, and its conservation issues and landowner needs, is being addressed through Audubon-California's Willow Slough Watershed Rangeland Improvement Program (WSWSRIP), also funded by CALFED. The staff and activities of both programs are complimentary and mutually supportive.

The first year of work under the LUSSWIP, which started September 1, 2001, has been intense, focused and successful. We put significant effort into contract and sub-contract development and completion. There were differences between CALFED and the USDA in contract requirements, which stalled the process, however contracts were finally completed and signed on December 31, 2001. During the contract phase, the RCD developed an Ecological Monitoring Plan (EMP) and our partners, the USDA Agricultural Research Service (ARS) at Oregon State University developed a Quality Assurance Program Plan (QAPP).

We held initial organizational meetings with project staff and/or partners to lay the groundwork for mutual support and smooth operation and communication. Also during these initial few months, the RCD, using county land ownership records and existing information from the Audubon USSWIP, contacted most if not all of the landowners in the watershed, announcing the program, its goals, and potential landowner benefits and opportunities. We began collecting the oldest available and most current maps, photos and resource information on the watershed from a variety of sources and putting this information into forms useful to the RCD. This has included the development of numerous map layers in the RCD's ArcView Geographical Information System (GIS).

A winter cover crop and row-crop conservation tillage research and demonstration site was secured with a watershed landowner and established in cooperation with the ARS partners. We actively solicited other landowner-cooperators for installation of conservation practices. Our Water Quality Specialist (WQS) purchased eight automated water samplers for use during the entire project at the research site, on the slough, and at individual project sites in the watershed. In spite of problems he encountered with manufacturer software, operation manuals, and the fact that the types of samplers have not previously been used in some of the settings the RCD required them for, he and a project intern were at last able to get them functioning in the field.

Early development of the Yolo OnePlan web-based conservation planning tool, got a strong start through our partnership with the ARS. Within the first few months, they began identifying existing self-standing resource assessment models - largely USDA Natural Resource Conservation Service (NRCS) models - appropriate to this project. They began acquiring the appropriate codes and documentation for these models and progress toward integrating these with a developing web-page interface advanced quickly.

The program management and communication aspects of the program include outreach and education activities. The RCD, along with its partners, conducted landowner education workshops on conservation methods that create or enhance farmland wildlife habitat while improving water quality and supporting farmer goals. We have created a LUSSWIP Project web-page on the Yolo RCD website at www.yolorcd.ca.gov/programs/LUSSWIP/lusswip.htm, and have also mounted conservation practice articles from the RCD publication "Bring Farm Edges Back to Life" on the site. Our Watershed Education Coordinator (WEC) has promoted outreach to the public through news articles, local school connections, and a booth at the County Fair. She has also created new conservation practice brochures and other landowner outreach materials.

The RCD Project staff and its local and regional partners have put energy and commitment into running a diverse and well-rounded program directed at assessing, improving, and planning local resource use in a watershed context, prioritizing the needs and values of the local landowners. We are looking forward to the following two years of the project.

Narrative by Task

Tasks 1 and 4—First Year Fall/Winter (2001-02) and Spring/Summer (2002) Watershed Assessment and Demonstration Projects

The first year of watershed assessment and demonstration work was broken into two separate, 6-month tasks for billing purposes. Functionally, Task 4 is a continuation of the activities of Task 1.

<u>Landowner recruitment and equipment purchase</u>

The RCD dedicated the first months of the project, which started September 1, 2001, to the identification of landowners interested in participating in the program, and gearing up for the diverse activities associated with project installation, slough and project monitoring, and watershed charting. We invited landowners via letter to participate in the program through the installation of conservation practices or the cover crop and conservation tillage study, and they were made aware of the overall scope of the project. We provided them with a map of the watershed, and asked them to return a questionnaire about their conservation needs and priorities. The landowner letter, questionnaire, and map are provided in the Appendix to this report. Through this process the RCD began to make connections with new landowners and to identify some who were interested in installing sediment traps or native plant hedgerows (referred to as ‘Riparian-Edge Hedgerows”) next to Union School Slough.

In order to get water samples from numerous sites along the slough and in the watershed, we required automated water samplers. The RCD’s WQS ordered eight Sigma Model 900 Max automated water samplers and six Model 950 Bubblers (for water level detection). These are the only technologically appropriate type of sampler available, yet they have not previously been used in the agricultural field runoff setting where we needed to apply them. Some innovation was required on our part in order to make them work and we encountered some challenges along the way. Some of these are discussed under “Problems and/or delays encountered” on page 36 below. After working through the challenges, the samplers are now working well for us.

During these first months we also purchased a large semi-truck trailer to use for field equipment and supplies and as a safe, secure storage shed for the samplers when they were not in use and. We had the wheels removed and secured a permanent location for it.

Ecological Monitoring Plan (EMP) and Quality Assurance Program Plan (QAPP)

As part of the contract process, the RCD prepared an Ecological Monitoring Plan (EMP) that outlined the projects to be monitored, the methods to be used, and the frequency and/or duration of each type of monitoring. CALFED has received this document, and it continues to be a functioning document for the RCD staff. At the same time, the USDA ARS researchers prepared a Quality Assurance Program Plan (QAPP) This QAPP addresses methods and equipment used for collection and analysis of soil and water quality samples for multiple tasks within the overall Union School Slough Watershed Program. CALFED has received this document as well.

Project sites:

Conservation Tillage and Cover Crop

In November 2001, a field research site was established with a landowner in the watershed in cooperation with our USDA ARS partners. The field management systems include a row-crop field in conservation tillage, one under conventional tillage, and a native perennial grass seed field.

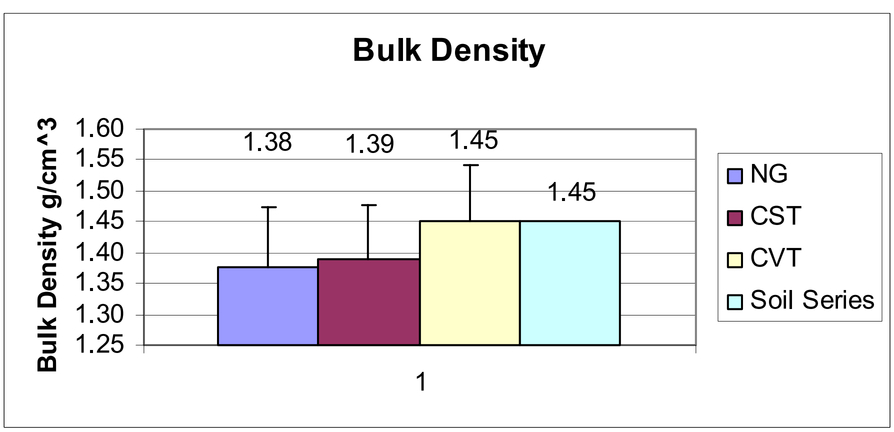
First irrigation on conventionally tilled tomato field.

Adjacent to these is a field with a winter cover crop. Each treatment is replicated four times within each field. There is a two-stage tailwater pond (sediment trap plus pond) associated with one of the fields and a sediment trap with another. A team of ARS researchers equipped the fields with instrumentation to measure soil temperature and humidity conditions. They also placed peizometers (specialized wells) at the lower ends of these fields and in and around the pond to facilitate taking water samples.

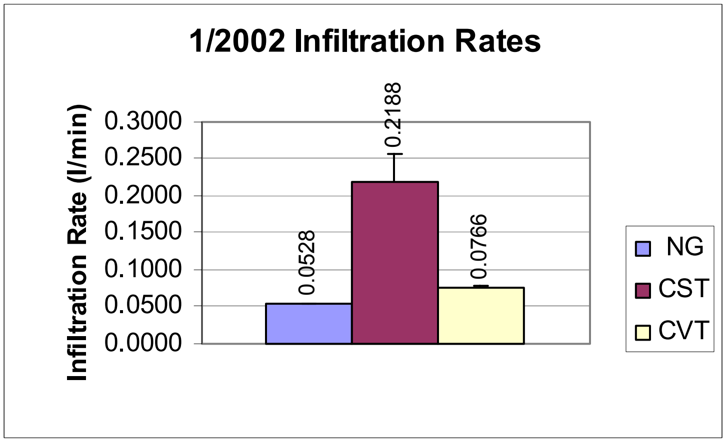
Peizometers in no-till wheat field.

They placed a small weather station in a central location to monitor ambient conditions. Data collection began 5 November 2001. Maps of the field layout, research plots, and pond are provided in the Appendix. The RCD has provided the local coordination with the landowner, collected plant, soil and water samples and downloaded data from all of these components on a specified schedule, with the ARS providing intermittent field expertise and all of the sample analysis. Soil samples are being analyzed for net nitrogen mineralization, bulk density, water infiltration, and compaction and other parameters. ARS is analyzing the water samples for sediment and nutrients and the aboveground crop vegetation and soil surface plant litter for growth and nutrient uptake. The information developed from this site will be used to populate the Yolo OnePlan with data and to shape and verify various aspects of the model. A complete analysis of all data is underway and will be provided in subsequent reports. The following is a brief summary of preliminary findings.

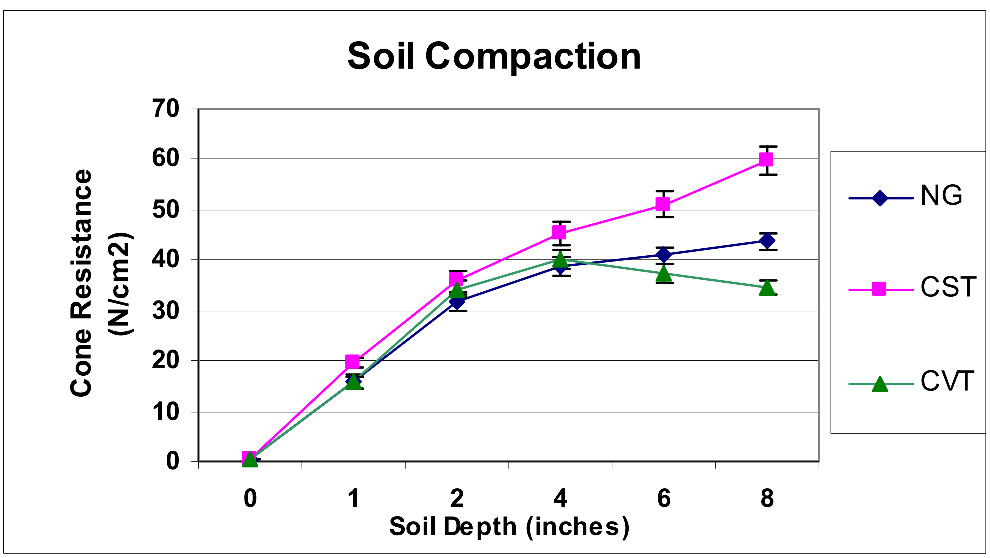
- After 3 years, soil bulk density in the top 15 cm was not significantly different between Conventional Tillage (CVT) and the Soil Series standard; a continuous perennial native grass seed crop (NG) was the same as Conservation Tillage (CST).



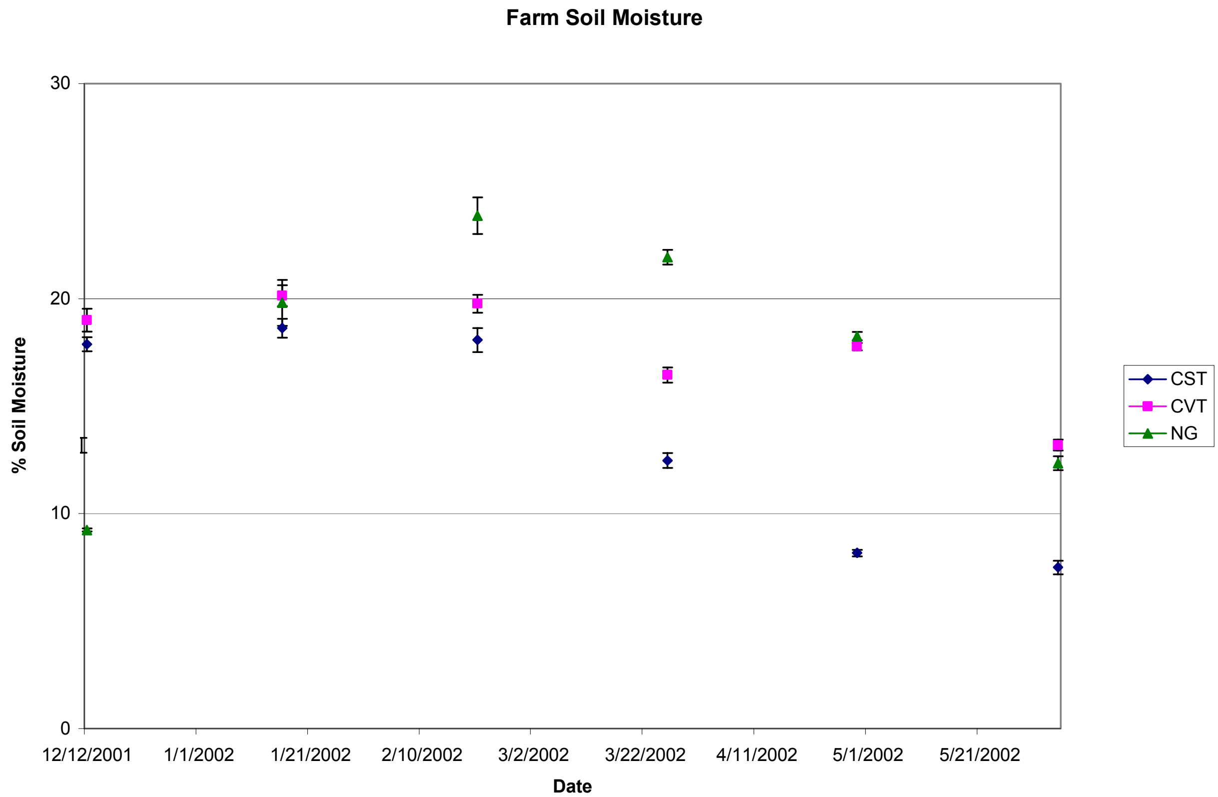
- Soil water infiltration rate was greatest in the top 15 cm of soil in the Conservation Tilled field (CST), compared to the Conventionally Tilled (CVT) and Native Grass field (NG).



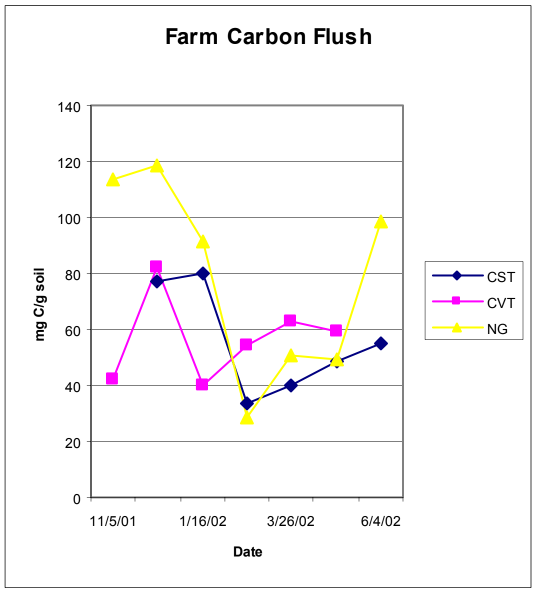
- Soil compaction, measured with a penetrometer, was the same in the top 2 inches of soil for the Conventionally Tilled (CVT), Conservation Tilled (CST), and Native Grass (NG) treatments, but greater compaction was evident for the CST treatment from 4 to 8 inches of soil depth. This greater soil compaction did not seem to hinder soil water infiltration (previous graph, 1/2002 Infiltration Rates). On the contrary, the greatest soil water infiltration was found for the CST soil.



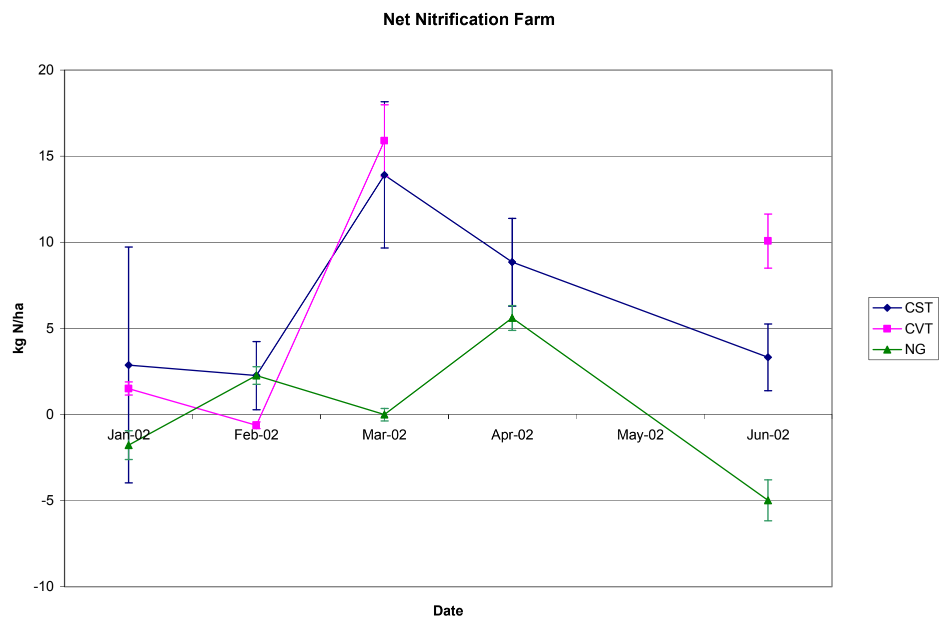
- Soil water content declined at a faster rate in the Conservation Tilled (CST) soil compared to the Conventionally Tilled (CVT) and Native Grass (NG) soils and was related to the crop growth and field irrigation conditions. The CVT soil was fallow during this fall-winter-spring season and therefore held soil water longer.



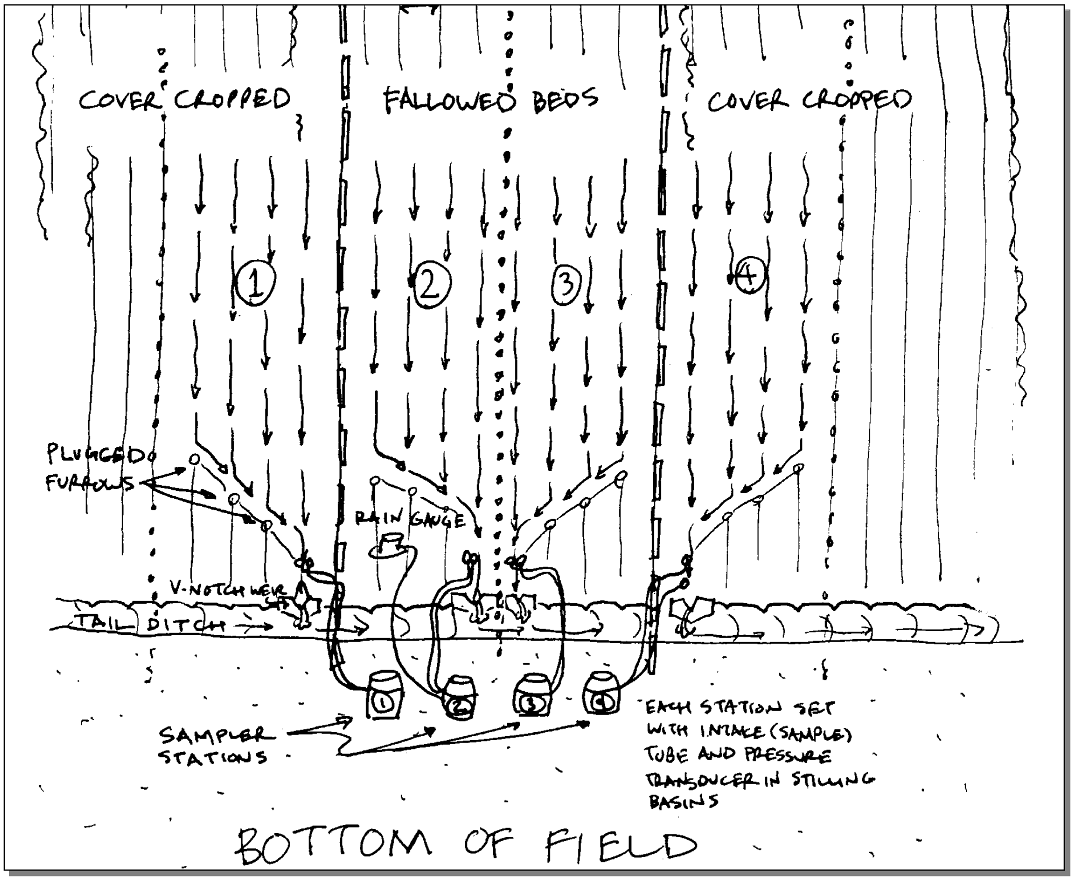
- Soil microbial biomass Carbon (MBC) was lower in the Conventionally Tilled (CVT) and Conservation Tilled (CST) soil in the fall and early summer. MBC declined in all soil treatments late fall and continued through the winter. During the early spring, MBC was greatest for the conventionally tilled soils and may be related to greater soil temperature and aeration.



- Mineralization and nitrification were tightly coupled in soil of all tillage treatments; hence, nitrate was the dominant form of nitrogen. Nitrification (below) and mineralization (similar data, not shown) were lowest in the Native Grass (NG) soil and highest in the Conventionally Tilled (CVT) and Conservation Tilled (CST) soils. This most likely occurred due to greater disturbance of these soils compared to the NG system. In late spring, Nitrogen immobilization was apparent in the NG soils but not in the CVT or CST soils.



In mid January 2002, we placed six Sigma automated water samplers (model 900 Max) in pairs to collect runoff from the winter **cover crop**, fallow, and row- crop conservation tillage (planted to wheat) fields. Beds on the fallow and cover cropped field were five feet wide and approximately two feet wide on the no-till field. At the low end of each field, a group of five furrows was channeled into one furrow. This allowed us to sample drainage from a larger "watershed" than a single furrow would provide, giving us greater volumes of runoff per weir/sampling station. The single furrow was set with a 90^{o} V-notch weir at its outlet.



Sketch of method for channeling runoff from five furrows into one.

Automated sampler probes behind V-notch weir.

RCD staff set pressure transducers and inlet tubing (each pair linked to an individual water sampler) in each stilling basin to take water level measurements and water samples as runoff collected behind each weir. The samplers were programmed to draw water samples only after the volume of water in the furrow began to flow over the weir. Additional samples were collected at 15-minute intervals as long as sufficient runoff was present. One sampler was fitted with a rainfall gauge, which inputted precipitation data in 0.01-inch increments every 5 minutes.

The majority of the rainfall during the first quarter of 2002 occurred in January. We were able to collect samples during a significant storm event during the latter half of the month. No significant precipitation fell in either February or March so no other water samples were collected. With the absence of substantial rain, the cover crop and row-crop no-till site's maximum potential benefit could not be measured this winter. No data or figures are shown because of the lack of noteworthy data points. The two samplers were removed when the cover crop was incorporated in late March. We collected a total of 68 water samples in addition to hundreds of rainfall and water level measurements. Sample printouts of raw data from a Sigma sampler, along with an example of what the data looks like when transferred into an Excel spreadsheet are provided in the Appendix.

The cover crop and conservation tillage study site is in a state of transition. All peizometers have been removed from the fields for harvest, burning (native grasses only), and/or tillage. Plant and fruit samples were taken in the conventional tomato field just prior to harvest. The field has been commercially harvested and post harvest tillage is in progress. The no-till wheat field required re-shaping and re-leveling due to planting bed breakdown, however, after this disturbance it will be maintained under no-till management. Plans are being made for re-installation of peizometers and electronic sensors in these fields when field preparation is complete. Fall re-growth has begun in the native grass field and the first vegetation samples of the winter growing season were taken on

September 19th, along with soil samples. We continue to sample the multiple arrays of peizometers in and around the tailwater pond associated with this site, although the pond is nearly dry.

Tailwater Ponds

The RCD has not planned to install any ponds as part of the LUSSWIP. We will be using existing ponds, some installed through the USSWIP, to monitor the affect that the ponds, and their associated sediment traps, have on water quality. We used three existing tailwater ponds during the past year and collected water samples from above the entry point to the pond and just below the exit during selected irrigation events between May and September. We kept these water samples frozen until they were shipped to the USDA Agricultural Research Service laboratory in Corvallis, Oregon. Although samples were collected over the entire irrigation season, laboratory results were only recently received and there has been limited opportunity for data analysis.

Peizometer array in tailwater pond

In the two-stage tail water pond associated with the conservation cropping system mentioned above, shallow (2.5 meters) peizometers (wells) were installed. Initially, one array of four peizometers was installed, later two more arrays were installed. These will improve our ability to determine the pond's influence on shallow groundwater chemistry and nutrient fluxes, as well as to better model pond hydrology. At the outset of the project we took surface and groundwater samples at five-week intervals. These samples were analyzed for nutrients and sediment. Most of the winter rainstorms did not result in runoff because of the dry soil conditions. The frequency and intensity of later storms caused short-term flooding and overtopping of the sediment trap. This overflow would have confounded the value of the samples so none were taken. When crop irrigation began in the spring, we monitored the irrigation water for sediment and nutrients. We are now sampling at approximately 2-1/2 week intervals – twice as frequently as other wells. We hope that this will allow closer tracking of changes in the pond and groundwater conditions.

The following table provides a cumulative seasonal summary of the shallow ground water (shallow wells) and surface water sampled from the farm pond receiving water from a conservation tillage field.

Shallow Ground Water	DOC (mg C/L)	TN (mg N/L)	TP (mg P/L)	NH4 (mg N/L)	NO3 (mg N/L)	ortho-P (mg P/L)
mean	15.8	3.47	0.218	0.302	2.78	0.075
Median	11.0	1.35	0.210	0.052	0.72	0.026
Max	76.3	18.31	4.123	13.809	21.69	2.910
Min	0.0	0.05	0.030	0.000	0.00	0.003
Pond Water						
mean	26.0	1.98	0.257	0.090	1.39	0.058
Median	19.0	1.85	0.223	0.040	0.02	0.035
Max	72.2	4.17	0.831	0.531	7.31	0.273
Min	0.0	0.00	0.000	0.000	0.00	0.000

DOC = Dissolved organic carbon
TOP = Total nitrogen
TP = Total phosphorus
NH4 = Ammonium-nitrogen
NO3 = nitrate-nitrogen
Ortho-P = ortho-phospahte

Sediment Traps

Sediment Trap during construction

Landowners were slow to respond to the call for cooperators, so sediment traps were not installed until late spring, some not until after the crop in the associated field was planted. Site selection focused on fields where runoff drained into USS. Ultimately we were able to evaluate five traps. These were located on five different farms, two were existing and three were newly installed. Prior to installation, RCD staff met with the farmer to discuss the design and location of the trap. Each trap site had different dimensions and was chosen based on field size, available space, access, farmer preference and crop. All five traps were eventually located on tomato fields. We surveyed most of the sediment traps for volume once construction was complete with the goal of doing a post-season survey also. The main design parameters for the sediment traps were:

1. To provide a wider, deeper ditch than the farmer's existing drain;
2. To establish ponding and outflow control with a flashboard type outlet; and
3. To have the outflow structure lower than the inflow structure/level of the trap.

The cooperating farmers excavated and installed the flashboard risers. When possible, the traps were measured immediately after excavation in order to estimate its initial capacity.

We collected water samples from above the entry point to the sediment trap and just below the exit during selected irrigation events between May and September. When sampling occurred, the number of furrows under irrigation was recorded in order to estimate sediment loss per acre. We kept these water samples frozen until they were shipped to the USDA Agricultural Research Service laboratory in Corvallis, Oregon. Although samples were collected over the entire irrigation season, laboratory results were only recently received and there has been limited opportunity for data analysis. At seasons end, where possible, we measured sediment depths to compute the volume of sediment collected. During the irrigation season, some traps were compromised when tail water from additional fields entered the trap. Also, some traps were disked in preparation for harvest before we were able to measure the collected sediment

Sample data sheet for the collection and logging of water samples are given in the Appendix

Hedgerows

Two riparian-edge hedgerow sites were confirmed with landowners earlier in the spring. The landowners have disked the portion of the sites closest to the farm roads in preparation for fall planting. We are making preparations for a prescribed burn this fall on one of the sites to clear vegetation not affected by disking. We have given both landowners copies of the planting plan and they have provided feedback and authorization. Seed orders are being finalized for the understory component of the hedgerow. Native grasses will be planted between late October and the end of November, depending on weather conditions. Shrubs will be planted in November. The RCD will be working in partnership with the SLEWS (Student and Landowner Education in Watershed Stewardship) Program, which connects high school students with landowners in the watershed who are actively involved in installing conservation projects. The Project Manager and Vegetation Management Specialist attended an organizational meeting during the summer to make initial connections with Schools and teachers who will be supporting plantings within the watershed. Planting dates have been scheduled with the SLEWS program and orientation of the participants is underway.

The following is an example plan for a Riparian Edge Hedgerow, as is to be implemented this fall.

Sample SLEWS Project Implementation Plan 2002-2003
Mr. Farmer
Lower Union School Slough Watershed Improvement Program

Location adjacent to Union School Slough destined to become a hedgerow and native perennial grass planting. Photograph taken in June 2002.

Project Overview

The implementation of the Riparian-Edge Hedgerow project on Mr. Farmer's property includes planting native trees, shrubs, grasses and sedges along a 720 ft. reach of Union School Slough adjacent to farmland. This work will be completed by a class of high school students participating in the SLEWS Program (Student and Landowner Education and Watershed Stewardship) during the 2002-2003 school year, in partnership with the Yolo County Resource Conservation District and under the direction of the landowner.

SLEWS Project Roles and Responsibilities Table

Landowner	• Have final authority in project design and implementation decisions • Develop the project plan (with RCD and SLEWS staff) • Notify project partners of changes, contingencies or problems as they arise so that project plan can be adjusted accordingly • Attend a minimum of three (3) SLEWS field days • Perform site preparation as provided in the project plan • Provide (or rent) necessary equipment

	• Provide for ongoing maintenance (weed control, irrigation, replacement planting) • Pay for replacement plant materials the following year, as necessary
SLEWS Staff	• Develop the project plan (with RCD and landowner) • Assist the landowner in implementation decisions • Perform site preparation and implementation as provided in the project plan • Lead the SLEWS student field days • Coordinate implementation schedule with landowner, project partners and participating SLEWS school • Coordinate learning activities for SLEWS students • Notify landowner and project partners of upcoming field days • Help conduct native grass seeding
SLEWS Students	• Implement project as provided in plan
RCD	• Develop the project design (with landowner and SLEWS) • Attend SLEWS student field days • Serve as a mentor to SLEWS students • Provide technical assistance as needed • Conduct native grass seeding

Project Location

The Mr. Farmer property is located in the lower Union School Slough watershed, a sub-watershed of Willow Slough. The entrance is at the intersection of County Rd. 92D and County Rd. 28, approximately 1 mile south of County Rd. 27. See the attached map.

RIPARIAN-EDGE HEDGEROW

Task 1: Site Preparation – Fall 2002
The landowner will prepare the planting site by disking and rolling to create a suitable seedbed for grass planting. If necessary, the landowner will also spray this area with herbicide to clear any weeds before planting.

Task 2: Native Grass Seeding – November 2002
The RCD and SLEWS staff will broadcast native grass seed into the disked area using a belly grinder and ATV-mounted harrow. If necessary, the landowner will spray this area with

Roundup or Rodeo (0.5-1 pint/acre) *within 10 days* of seeding to control any weeds that germinate prior to native grass emergence.

Grass species – by Subset (under revision)

Botanical name		Common name	lbs	Zone (sub-site)
Leymus	triticoides	Creeping wildrye	8	2, 3, 4
Hordeum	brachyantherum	Meadow Barley	1	2
Nassella	pulchra	Purple Needlegrass	2	3&4
Agrostis	exarata	Bentgrass	1	3&4
Elymus	glaucus	Blue wildrye	2	3&4
Melic	californica	Onion grass	1	3&4

Task 3: Native Tree and Shrub Planting – December 2002-February 2003

Under the supervision of the RCD and SLEWS staff and the landowner, the SLEWS students will plant approximately 123 native trees, shrubs, vines, and herbs in the hedgerow line as marked with flags. Tentative timing for planting the container stock is in December, with cuttings planted in January or February, but the planting should take place after the grasses have been seeded and have emerged. A fertilizer tablet or packet will be placed in each plant hole and a Tubex tree protector will be placed over each plant and anchored with a bamboo stake. If necessary, the landowner will augur 6” diameter holes, 2-4 feet deep, in preparation for the planting.

The landowner and the RCD and SLEWS staff will design the planting plan and flag the site prior to the planting day. The RCD will purchase the plants and plant accessories for 720 ft. of hedgerow.

Hedgerow Plant List

Botanical name		Common name	Plant type	Number
Artemisia	douglasiana	Mugwort	shrub	9
Juglans	californica	Black Walnut	tree	6
Salix	goodinggi	Black willow	tree	3
Sambucus	caerulea	Blue elderberry	shrub	6
Acer	negundo californicum	Box elder	tree	3
cephalanthus	occidentalis	Button brush	tree	3
Eriogonum	fasciculatum	California buckwheat	herb	6
Szauschneria	californica	California fushia	herb	3
Rhamnus	californica	Coffee berry	shrub	3
Populus	fremontii	Cottonwood	tree	3
Baccharis	pilularis	Coyote bush	shrub	6
Muhlenbergia	rigens	Deergrass	grass	9
Aristolochia	californica	Dutchman's pipevine	vine	6
Mimulus	aurantiacus	Monkey flower	herb	3
Baccharis	viminea	Mulefat	shrub	6
Asclepias	fascicularis	Narrowleaf milkweed	herb	6
Cercis	occidentalis	Red bud	tree	6
Salix	laevigata	Red willow	tree	3

Salix	lasiandra	Shining willow	tree	6
Plantanus	racemosa	Sycamore	tree	3
Heteromeles	arbutifoia	Toyon	shrub	3
Querqus	lobata	Valley oak	tree	3
Rosa	californica	Wild rose	shrub	6
Achillea	millefolium	Yarrow	herb	6
Vitis	californica	Wild grape	vine	6
				123

Task 4: Plant cuttings – January 2003

Under the supervision of the RCD and SLEWS staff and the landowner, the SLEWS students will plant extra trees and shrubs from cuttings at selected locations within the hedgerow. The cuttings will be gathered by the RCD and SLEWS program staff from the landowner's stock, or other stock, as arranged.

Task 5: Plant Native Wetland Vegetation – April 2003

Under the supervision of the RCD and SLEWS staff and the landowner, the SLEWS students will plant sedges and rushes along the slough bank. These will be planted on 1 foot centers near the water's edge.

Botanical name		Common name	Zone (sub-site)
Juncus	xiphioides	Flat bladed rush	1
Juncus	balticus	Baltic rush	1
Eleocharis	macrostachys	Common spikerush	1
Carex	barbarae	Barbar sedge	1
Carex	pregracilus	Slender sedge	1

Task 6: Install Drip Irrigation System – February 2003

Under the supervision of the RCD and SLEWS staff and the landowner, the SLEWS students will install a drip irrigation system along the tree and shrub line. The RCD will purchase supplies prior to the field day. The landowner will perform any necessary connections or modifications to the water source (portable pump).

Task 7: Install Bird Boxes – February 2003

Under the supervision of the RCD and SLEWS staff and the landowner, the SLEWS students will construct and install two wood duck boxes and 4 bluebird boxes around the pond site.

Task 8: Weed Control, Monitoring of Plant Survival and Bird Boxes – April 2003

Under the supervision of the RCD and SLEWS staff, the SLEWS students will mechanically remove (hoe or hand-pull) non-native, invasive species from the planted area. The students will also monitor the survival of the native plants, as well as the bird life at the project site.

Project Check List

	Task		Completion Date:	Responsible Party
☐	1	Prepare sites	Oct-02	Landowner
☐	2	Seed native grasses and forbs	Nov-02	SLEWS staff
☐	2	Spray seeded areas	Nov-02	Landowner
☐	3	Augur holes (if necessary)	Nov-02	Landowner
☐	3	Plant trees and shrubs	Nov-02	SLEWS students
☐	4	Plant cuttings and grasses	Jan-03	SLEWS students
☐	5	Plant sedges and rushes	Feb-03	SLEWS students
☐	6	Purchase irrigation supplies	Feb-03	RCD
☐	6	Install drip system	Mar-03	SLEWS students
☐	7	Install bird boxes	Mar-03	SLEWS students
☐	8	Monitor plants and birds	Apr-03	SLEWS students
☐	8	Control weeds	Apr-03	SLEWS students

Canal Banks

As mentioned in previous reports, canal bank stability evaluations have not been completed because the canals have been bank-full or nearly so for the entire irrigation season. Water levels in the local irrigation canals are typically dropped on or shortly after October 1st each year to allow cleaning where needed. Anticipating this, we have designed the data sheets for canal bank stability monitoring and the canal bank reaches have been delineated. An example datasheet has been provided in the Appendix. These assessments will be started during the month of October.

Other Project Activities

Overwintering Insect Monitoring

The monitoring of insects overwintering in native plant hedgerows was conducted during the past winter and early spring and is complete. This study was designed to evaluate the suitability of different border habitats, specifically native hedgerow and grass borders, for overwintering insects with relevance to agricultural systems. Six sites were used in this study. Four of them were used in previous studies. Each had both a native grass stand and a perennial hedgerow. Native grass stands at two of these sites were recently eliminated, and two additional well established native grass borders were selected as replacement sites for this study. Each native border was located on a standard row crop farm in Yolo County.

Following is a complete report on the results of this study.

Final Report: Overwintering Insect Survey

Corin Pease, Dept of Entomology, UC Davis

Introduction:

Pest and beneficial insect are known to use border habitats for shelter during the winter months. These habitats may effect insect populations in adjacent agricultural crops. This study was designed to evaluate the suitability of different border habitats, specifically native hedgerow and grass borders, for overwintering insects with relevance to agricultural systems

Methods:

Six sites were selected for this study. Four sites were used in previous studies, each had both a native grass stand and a perennial hedgerow. Native grass stands at two of these sites were recently eliminated, and two additional well established native grass borders were selected as replacement sites for this study. Each native border was located on a standard row crop farm in Yolo County, California.

Native shrubs or forbs, such as California buckwheat (*Eriogonum fasciculatum*), Coyotebrush (*Baccharis pilularis*) and Mexican elderberry (*Sambucus mexicana*), native grasses such as deer grass (*Muhlenbergia rigens*), creeping wildrye (*Leymus triticoides*), and others, and the non-native Himalayan blackberry (*Rubus discolor*), were sampled to determine their role in pest and beneficial insect overwintering. Native grass borders were sampled twice during January and February. Perennial shrubs were sampled once in mid February. This sample was limited to three species, coyotebrush, California buckwheat, and elderberry. Previous samples suggest that these three are the only species to provide sufficient habitat for overwintering insects.

Overwintering insects were surveyed using a one-foot square quadrat. Plant litter and soil surface was searched for insects within each quadrat. A 1% soap solution was sprayed on the soil surface and plant litter to irritate insects so they were easier to locate. Fifteen one-foot square areas at each site were inspected for overwintering insects in native grass stands and under each hedgerow plant. In addition, we sampled deergrass at three of the sites once in mid February. Fifteen one-foot square samples were taken of the plant crowns. Each crown of this species was approximately one foot square. Crowns were spread open and searched for insects. Deer grass is a very large bunch grass, which is not included in the native grass stands but provides ideal habitat for many insects. Fifteen one-foot square samples were taken of creeping wildrye at one site as well. A blackberry border on the opposite side of a field with a native grass stand was sampled for a comparison. Blackberry is known to be overwintering habitat for stink bugs, an important pest of tomatoes. None of the other sites had adjacent blackberry so comparisons are based solely on this site. Soil sampling for overwintering insects was not possible due to the lack of resources for the sampling and rearing of larvae. However, in March observations were made in native grasses for spotted cucumber beetle (*Diabrotica umdecipunctata*) emergence. Sweep net samples were also taken in native grasses in March to monitor cucumber beetle emergence and note other species.

Results:

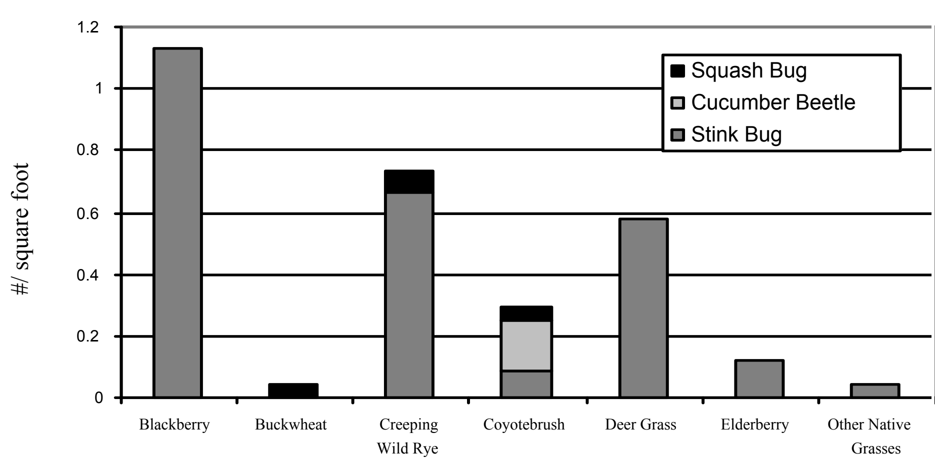
The habitat types observed differed in their ability to provide suitable overwintering conditions for insects of agricultural relevance. Pest and beneficial insects observed in this study are noted in table 1. Other species were observed but were not included in this study because they are not relevant to agricultural pest control.

Table 1: Pest and beneficial insects monitored

Beneficial Insects Monitored	**Taxon**	**Pest Insects Monitored**	**Taxon**
Minute pirate bug	*Orius tristicolor*	Stink bugs Consperse stink bug Southern green stink bug Uhler's stink bug	 *Euchistus conspersus* *Nezara viridula* *Chlorochroa uhleri*
Assassin bug Leafhopper assassin bug Spined assassin bug	 *Zelus spp.* SINEA DIADEMA	Spotted cucumber beetle	*Diabrotica undecimpunctata undecimpunctata*
Big eyed bug	*Geocoris spp.*	Squash bug	*Anasa tristis*
Green lacewing	*Chrysoperla spp.* *Chrysopa spp.*	Grass aphid	*Rhopalsiphum sp.*
Lady beetle	HIPPODAMIA CONVERGENS		
Damsel bug	*Nabis spp.*		
Carabid Beetles	Carabidae		
Hoverfly	***Syrphinae***		

Some pests were observed overwintering in border habitats (figure 1). The primary pest insect observed in the border habitat was the consperse stink bug (*Euschistus conspersus*) among other stink bug species noted in table 1. Blackberry bordering one site had the highest average number of stink bugs, 1.13 per sq. ft. Creeping wild rye and deer grass also provided sufficient conditions for overwintering stink bugs, harboring 0 .67 /sq ft. and 0.58 /sq. ft., respectively. Very low numbers of stink bugs were also found under elderberry, 0.13 /sq. ft., coyotebrush, 0.08 /sq.ft., and other native grasses, 0.04 /sq.ft.

Fig 1: average number of pest insects observed overwintering under various border habitats



Squash bugs were observed overwintering under buckwheat, creeping wildrye and coyotebrush, however their numbers were extremely low, 0 .04 /sq. ft., 0.07 /sq. ft. and 0.04/sq. ft., respectively. Cucumber beetles were only observed under coyotebrush, 0.17 /sq. ft.

Several species of beneficial insects were also observed overwintering in border habitats (table 2). High numbers of lady beetles (*Hippodamia convergens*) were found in deer grass, with aggregations as high as 100/plant, and an average of 3.9 /sq.ft. Several lady beetles were also found in the other native grasses and averaged 0.2 /sq.ft. Minute pirate bugs (*Orius tristicolor*) and Big eyed bugs (*Geocoris* spp.) were found under Buckwheat, with concentrations of 0.25 /sq. ft. and 0.17 /sq. ft. respectively. We found several carabid beetles under creeping wild rye and deer grass, averaging 0.13 /sq. ft. and 0.1 /sq. ft. respectively. Assassin bugs (*Zelus* spp) were found in deergrass and averaged 0.1 /sq. ft.

Native grass stands were montitored at four sites in March for emerging cucumber beetles and other pests. No cucumber beetles were observed in sweep samples. However we did observe aphids in sweep samples of creeping wild rye. The species of aphid was identified (Sandy Kelly, Dept of Entomology, UCD) as a *Rhopalosiphum sp.* Many species within this genus are vectors of barley yellow dwarf virus and are pests of small grains. No aphids were found on native grasses other than creeping wild rye. No stink bugs were observed on native grasses in March. Beneficial insects observed on native grasses included, lacewings (*Chrysoperla sp*.), lady beetles, damsel bugs (*nabis sp*.) and syrphid flies (family syrphidae).

<u>Discussion:</u>

Native hedgerows provide resources and habitat for many beneficial insects. Previous studies showed native shrubs and native grasses bordering farm fields were visisted by a wide array of beneficial insects. However, some plants may also provide habitat for pest insects.

Results from this study show that some beneficial insects use native borders as overwintering habitat. In particular, impressively large aggregations of lady beetles in deer grass may increase habitat for these insects near farm fields. The majority of lady beetles are assumed to migrate to the foothills to overwinter, however deer grass seems to provide adequate overwintering habitat in the Sacramento Valley. Other beneficials observed in this study may also benefit from increased habitat provided by native hedgerows and grasses.

Pest insects were observed overwintering in native borders. Cucumber beetles and Squash bugs were observed very infrequently. Cucumber beetles visit coyotebrush flowers in the fall and may drop to the ground beneath the plant to overwinter, however the numbers detected suggest that cucumber beetles do not prefer coyotebrush as overwintering habitat. Several squash bugs were observed under buckwheat, creeping wild rye and coyotebrush. Again, the numbers detected do not suggest that these plants provide preferred habitat. Stink bugs on the other hand were observed in high enough numbers under deer grass and creeping wild rye to suggest that these plants provide a habitat that is comparable to black berry. Black berry is considered the main overwintering location for consperse stink bugs. These plants provide a well drained insulated space that stink bugs need to survive the winter. Instances where stink bugs were found under elderberry and coyotebrush occurred under draping branches that were touching the ground. In this situation these plants will also provide the needed conditions for stink bug overwintering.

We detected *Rhopalshiphum sp.* aphids in creeping wild rye in March. Most species within this genus can transmit barley yellow dwarf virus of wheat and barley. It is not known whether creeping wild rye is a host for this virus. However, aphid vectors of barley yellow dwarf are thought to come from long distances and native grasses are not considered to be a threat for barley yellow dwarf on wheat in the Sacramento Valley (pers. com. Dr. Brice Falk, Dept of Plant Pathology UCD).

Farmscaping with native grasses and hedgerows may be beneficial but farmers must consider whether particular plants may provide habitat for pests that are of concern on their farms. Stink Bugs are the primary pest of concern in the Sacramento Valley. Elderberry and coyotebrush can be managed to prevent habitat for stink bugs by pruning draping branches periodically. Farmers may want to avoid plants such as creeping wild rye and deer grass in their farmscape design. However, deer grass was shown to provide overwintering habitat for large numbers of lady beetles. Farmers must evaluate their plant choices based on the crops they grow and the relative importance of particular pests and beneficials on their farm.

Wildlife monitoring: birds, mammals, reptiles/amphibians

Monitoring of the wildlife using conservation projects in and around farmland has begun. This monitoring will take place in hedgerows of three age categories, canal bank reaches, and ponds. The hedgerow sites being monitored include the two new riparian-edge hedgerow sites, two medium age (4 – 5 years) hedgerows, and two mature hedgerows. The three paired (vegetated and non-vegetated) canal banks that will be evaluated for bank stability, will be monitored as well as two established tailwater ponds. Bird monitoring is being conducted separately from other wildlife monitoring. We have devised schedules for each based on seasonality and have completed the first round.

RCD project manager setting up a baited track station.

We placed baited track stations (see Yolo RCD publication "Monitoring on Your Farm" page 98) at each site in the evening, and checked them in the morning for tracks. If we were unable to identify the tracks with standard field guides, they were taken to the UCD wildlife museum for identification. We completed walking surveys of each site, checking for tracks, fur, skin, feathers and other sign. All observations were recorded on summary data sheets. A sample single site data sheet and the summary of one round of monitoring at these sites can be seen in the Appendix.

Bird monitoring is being conducted separately, but at the same sites. We are using a standard strip census method, modified to fit the agricultural setting, which is not typically described in bird monitoring guideline references. We are visiting the sites in the early morning hours, typically visiting one site per day. Birds seen or heard using the hedgerow, near the hedgerow, or flying over are all noted, but only those actually within the hedgerow are recorded in the totals. A summary of observations for one site is provided in the Appendix.

Watershed Charting

The early work on watershed charting involved acquiring aerial photos and maps of the watershed. We located a number of historic paper watershed maps and aerial photos from the late 1800's and the early to mid- 1900's in the UC Davis library Historic Maps Department and from various other sources. A set of copies of the aerial photos was mounted for office staff reference. Continuing work has involved obtaining digital data and re-projecting it to combine it with data layers that were previously obtained (See quarterly report #1) for our ArcView GIS system. Some maps have been developed which delineate different land uses and habitat types that exist along the Union School Slough. Some of our land use data, for example from the Important Farmlands Data, has been collected over several years, thus we had to create maps that illustrate changes in land use over time.

We have obtained the following digital maps:

- Aerial photographs: USDA NRCS State Office
- Rivers Yolo County Dept. of Planning and Public Works
- Roads Yolo County Dept. of Planning and Public Works
- Towns Yolo County Dept. of Planning and Public Works
- Townships Yolo County Dept. of Planning and Public Works
- Parcels (boundaries) Yolo County Dept. of Planning and Public Works
- Soils USDA NRCS State Office
- Topography USGS Enhanced Digital Raster Graphics, Beartooth Mapping, Inc., National Cartography and Geospatial Center, Ft. Worth, TX
- Land Use Data from the Department of Water Resources.
- Geology Data from the USGS (in process)
- Important Farmlands Data from the Department of Conservation, Farmlands Mapping and Monitoring Program
- Habitat layer from the County of Yolo Planning and Public Works Department

Yolo County RCD intern mapping a small patch of arundo along Union School Slough.

In addition to the charting discussed above, we have completed a survey of the lower Union School Slough. The goal of this survey was to chart signification populations of native and non-native plant populations along the slough. As we located populations, we mapped them using a Trimble Geo Explorer III GPS unit, made notes and took photographs to capture general characteristics of the slough including species diversity, bare ground, and drainage ditches connected to adjacent agricultural fields. The survey began in May 2002 and was completed it in August 2002 by walking the lower portion of Union School Slough from County Road 96 moving west to ¼ mile past County Road 88. We have been able to produce maps that display priority weed locations and significant native plant populations along the slough. A copy of one of thes maps is included in the Maps section of the Appendix. *Arundo donax*, a weed broadly recognized as being a serious problem in riparian systems, was found along Union School Slough during the survey and may be the focus of control efforts in the future. One of the NRCS staff members co-located in the same office with the RCD has provided support in exploring and testing new methods for organizing and displaying our Arc View filing system. We have included a number of maps of the Lower Union School Slough Watershed in the Appendix.

Watershed Sediment Inventory

We have partially completed a visual assessment of sediment sources in the upper watershed using the UC Cooperative Extension *Range Sediment Delivery Inventory and Monitoring technique, Lewis, Tate, and Harper, Pub. #8014*. The first portion was partially completed in July. Our lack of familiarity with the technique meant coordinating with NRCS staff who had expertise and experience. There is also significant time involved in hiking the largely road-less upper portions of the watershed. Because of the time block required it has been challenging to schedule additional time in the upper watershed. Completion of the inventory is planned for early fall. We have included the following in the Appendix: the sediment delivery inventory publication, our revised (AGNPS) datasheet, maps of the delineations of the upper watershed into quadrants, and some initial data taken on the upper watershed.

Slough Sampling

Some of the automated samplers (Sigma 900 water sampler and 950 Bubbler for water level measurements) mentioned under "Landowner recruitment and equipment purchase" above were purchased to collect storm event runoff at pre-selected locations along Union School Slough for nutrient and sediment analysis. The samplers arrived in early January and learning to use the new equipment properly took time (see "Problems and/or delays encountered" at the end of Tasks 1 and 4, page 35). Using them effectively was complicated by the absence of precipitation, but conversely, because of the light precipitation, no storm events were missed during the initial learning curve.

Automated sampler, bubbler and weather station set up at slough sampling station.

We installed one automated sampler (Sigma 900 water sampler and 950 Bubbler for water level measurements and rainfall gauge) at site 103 along Union School Slough and it was programmed to collect water samples every 12 hours. Site 103 has been in place since early April and samples have been collected since that time. A second automated sampler (site 102) is located in the upper section of the slough and it collected samples into April. Since there is no irrigation above this point, this location is only useful during the life of the runoff from the upper watershed. A third sampling point (site 101), located high in the watershed has been selected. Construction of a platform to protect the equipment from the cattle will begin in October. This location can only be sampled as long as winter/spring runoff continues. Acquiring landowner approval to establish permanent locations for the automated samplers in the lower watershed, as well as having those locations be secure from vandalism has been difficult.

Because only three secure on-stream sites could be confirmed for the automated samplers (two ceased to flow after mid-spring), we began collecting discrete water samples from six sampling points along the slough twice weekly.

Water Quality Specialist taking sample from slough.

A map showing the sampling locations along the slough is included in the Appendix. We used a flow-meter ("FP201 Global Flow Probe") to measure slough velocity on a weekly basis. Other data taken included sampling date, sampling time, number of samples collected, stream velocity(s), and stream depth. Sample data sheets for the collection of these samples are provided in the previously mentioned "Sample data sheets for water samples" section of the Appendix. All of the water samples were sent to the USDA Agricultural Research Service laboratory in Corvallis, Oregon and analyzed for nitrate (NO_3,), Total Nitrogen (TO), phosphate (PO_4), ammonium (NH_4), (DOC) and sediment content dissolved oxygen content. The results from these analyses were only recently received and there has been limited opportunity for data analysis. Following are graphs of some of the data collected from one of the sampling points along Union School Slough.

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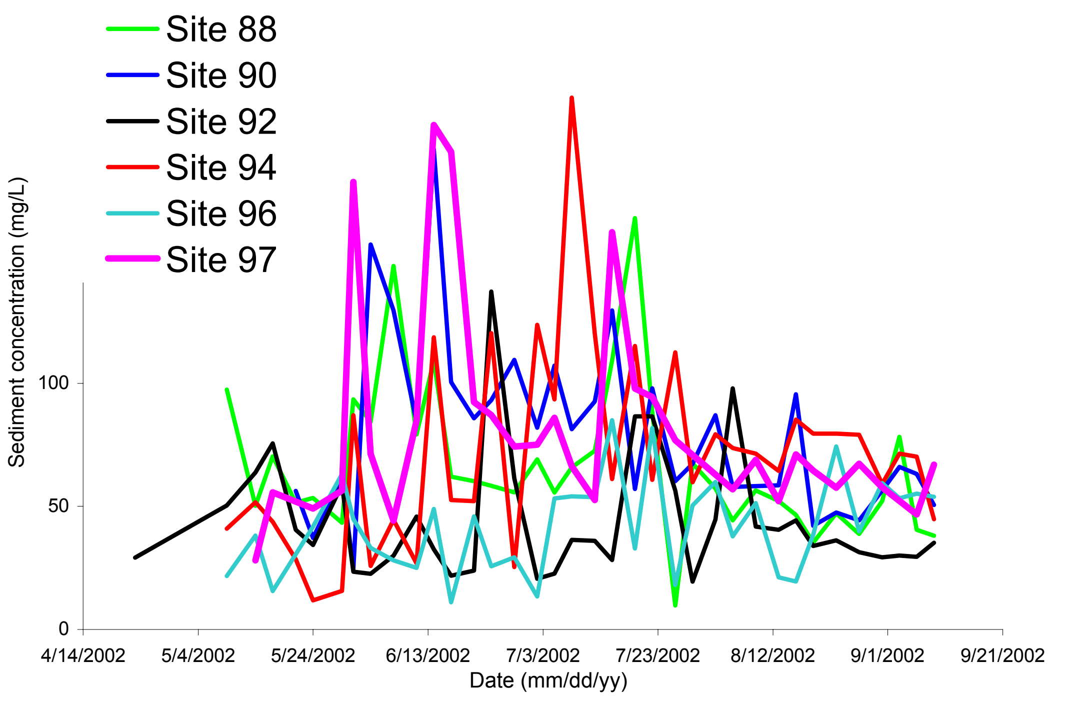
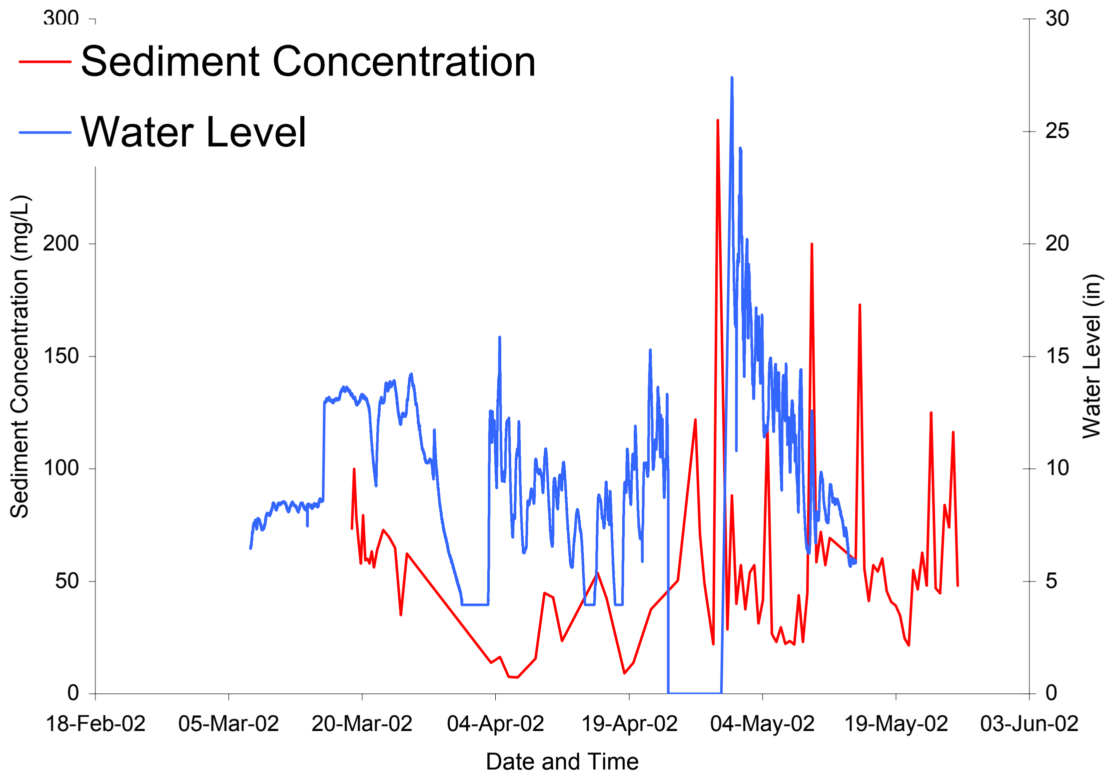
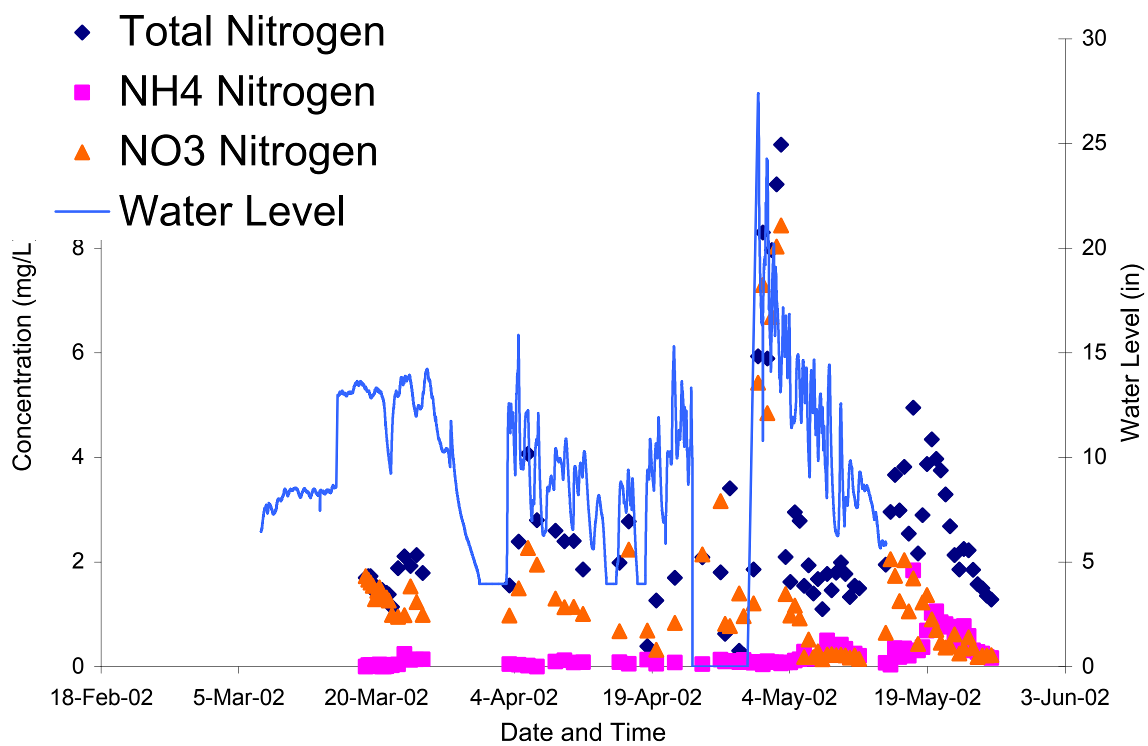


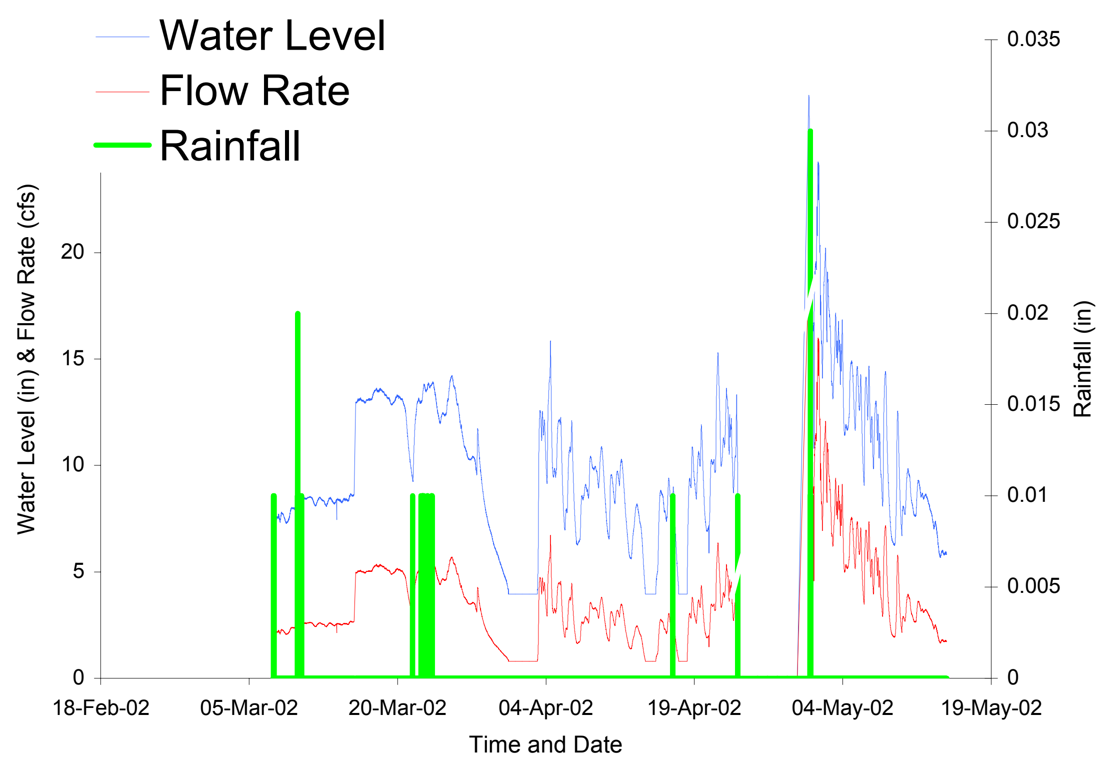
Sediment concentration at the six sites sampled maually on USS



Sediment concentration vs. water level at site 103 on USS



Total nitrogen, ammonia, and nitrate concentration vs. water level at site 103 on USS



Water level and rainfall at site 103 on USS

Hydrologic Assessment of Union School Slough

A hydrologic assessment of Union School Slough by Mark Cocke, State Hydrologist with NRCS, was begun under Audubon's Union School Slough Watershed Improvement Program. That assessment has been completed and the report is included in full in the Appendix.

Additional landowner assistance

This grant includes a partnership with CALFED Grant #98-E13 and 01-N31 to Audubon California. In the spirit of that partnership, this project is providing ongoing support to landowners whose conservation projects were started under Grant #98-E31. One of those landowners will be planting additional native grasses, sedges, and trees on property within the watershed over the next six months. The RCD, through the Lower Union School Slough Watershed Improvement Program, and in cooperation with the SLEWS program mentioned above, has already provided assistance in the planning process and will provide additional assistance on planting days.

The RCD Vegetation Management Specialist is also working with a local landowner in the upper Willow Slough Watershed to control tamarisk infestations.

Problems or Delays Encountered

- We felt there were significant delays associated with the automated water samplers. They were ordered in November and were received two months later. After working with the samplers we discovered that there were problems with the manufacturer's internal software. It took four months for them to resolve this. Also, the bubbler units did not interface well with the samplers. We spent quite a bit of staff time working on getting the samplers and the bubblers work together. The manufacturer's operation manuals were not clearly written and it took additional time to rewrite and abbreviate the instructions.
- These samplers, and others like them, are typically designed for water flow in streams and rivers. We intended to use them not only in Union School Slough, but also to sample runoff from farm fields in order to learn more about the water quality associated with standard agricultural practices. The probes for water sampling are not designed for the extremely low flows and minute water level changes associated with farm field runoff. This presented an additional challenge. Ordinarily this would have resulted in lost opportunities for the collection of water samples, however, the way weather patterns unfolded, the timing and duration of storms resulted in virtually no field runoff. We would suggest that others intending to use automated samplers in an agricultural setting contact us.
- In spite of efforts made to maintain good communication with landowners, irrigation schedules can sometimes change with no notice. This meant that some irrigations were over before we knew they had started. Also, some of the sediment traps that were installed through this project were disked up before we could measure the amount of sediment they had collected during the irrigation season. This is not unexpected, given the landowner stresses associated with harvest. One of our best strategies in the past to deal with both of these types of situations has been to start out with more sites than we need in the end.
- The canal bank stability evaluations were originally slated for completion prior to the irrigation season when canals were still empty. Significant contract development demands at the outset of the project prevented the collection of this data when we had originally expected to. The irrigation canals then filled for the season, preventing these evaluations for the duration of the growing season. The water levels in our local canals are typically dropped shortly after October 1st and we are expecting to complete these evaluations during the month of October.
- The collection of Sediment Delivery Inventory data from the upper (foothill and mountain) watershed, as discussed above, was delayed for several reasons. It took time to arrange to collaborate with someone who already had expertise in the technique (for assistance and training). Local NRCS staff determined that revisions were needed in the field data sheets so as to make the information applicable to the AGNPS model, which will be used in the OnePlan. Our Field Office Range Conservationist re-designed the data sheets for us. Hiking the upper road less reaches of the watershed, although pleasant, requires full days to complete only a portion of the evaluations. We expect to complete the final data gathering this fall.

Other issues or comments

- The majority of recent field-staff time has been devoted to monitoring and data management. The irrigation season is nearly at a close, with water shut-offs anticipated on or about October 1^{st}. Crops at or adjacent to all project sites are harvested and fall field tillage is in progress or complete. Preparations have been made for the planting of two riparian-edge hedgerows and for the installation of field water quality, soil condition and weather monitoring equipment.
- No other issues of concern have arisen.

Task 2—First Year OnePlan Development

This task is focused on the development of an internet-based conservation decision-support tool for landowners and professionals. We are working closely with our USDA ARS Partners in Corvallis for the completion of this task. We have met a number of times to discuss the development and framework of the tool and continue to exchange phone calls and emails to that end. We are pleased to say that the web tool development server has been brought on-line. While development is underway, access to the server URL is being limited. A print-out of the site home page is included in the Appendix. For the site-specific URL please call the RCD Executive Director or Project Manager at 530-662-2037, extensions 116 and 118, respectively. Specific components of the tool are under development using the NRCS "SWAPA+H" (Soil, Water, Air, Plant, Animal + Human) physical effects framework. Details of the current status of various components are listed below.

Web-based RUSLE-1

- The DOS program RUSLE (Revised Universal Soil-Loss Equation) 1.06 is being converted to a web-based application. Conversions of the parts that compute the factors R (rainfall erosivity), K (soil erodibility), LS (length and slope), and C (cover management) have been completed. Conversion of the part that calculates the P (conservation practices) factor is in progress. Web-based RUSLE I allows the soil type of a field (hence the K factor of the field), as well as the area of the field, to be determined with the web-based GIS (geographical-information-system) interface. This application can be accessed from the link "RUSLE" on the web page by clicking on "RUSLE". Two unique features implemented for the web-based RUSLE I are, 1.) The area of a field can be computed with a soil map; and 2.) The values of the C sub-factors over half-month periods can be displayed as line graphs.

Yolo County Soil-Map Viewer

- A web-based soil-map viewer for Yolo County has been implemented for the soil map provided by Yolo RCD. In addition to the soil map, this map viewer can present layers such as county boundaries, roads, and digital orthographic images. Map navigation functions such as zooming and panning are supported, and detailed information about any selected soil can be displayed for a location by a mouse click. This soil-map viewer was implemented by using ArcIMS, ActiveX Connector, and Microsoft ASP.NET. This application can be accessed from the link "Soil Map" at the URL for the web page development site.

Maximum Daily Load (STMDL) Application

- A web-based application for inventory management of sediment point-sources has been implemented. Information can be retrieved about a sediment point-source by clicking on the symbol provided on the map for the sediment source, as well as by using a text-based query. This application can be accessed from the link "STMDL" at the web page URL.

Web-based Pesticide Screening Tool (Web-PST)

- A web-based software tool for screening the potential risk of a pesticide on water quality has been developed. The tool is called Web-Based Pesticide Screening Tool (WebPST). It uses the formulas and standards specified by Soil/Pesticide Interaction Screening Procedure Version II (SPISPII). It closely models the stand-alone Windows application Windows Pesticide Screening Tool (WIN-PST) released by USDA-NRCS. For a given pesticide, soil type, and cultivation practice, Web-PST evaluates the likelihood of pesticide loss and its potential risks to both humans and fish. In addition to hazard rating, Web-PST allows the user to generate a list of the pests that can be controlled with the pesticide selected. It also generates a list of the types of sites where the pesticide is commonly applied.

- Web-PST uses qualitative ratings to classify the relative likelihood of pesticide loss from field boundaries via runoff and from below the root zone via percolation. Algorithms using soil properties and pesticide properties group the soil types and pesticides separately into leaching, adsorbed runoff, and solution runoff loss potentials. The interaction ratings are based on the soil and pesticide ratings using rule-based algorithms developed by Don Goss and R. Don Wauchope, USDA-ARS, Tifton, GA. These ratings are then adjusted by case-specific conditions applicable at the field level. The interaction ratings generated for the pesticide are used along with the pesticide toxicity data to calculate the level of hazard or risk from its application. The risk factor is assessed and rated by four classes as: "high", "intermediate", "low", and "very low". This application can be accessed from the link "Web-PST" at the web page URL.

Web-Version of "*Bring Farm Edges Back to Life!*"

- The Yolo RCD Landowner Conservation Book "Bring Farm Edges Back to Life," currently in its 5th edition, has been converted into Web pages and is accessible at the site URL. A few sample pages from the publication are included in the Appendix.

Prototype Water-Body Simulation Program

- A prototype program simulating water flow in a reservoir was created using water-body components such as watersheds, sub-basins, and hydrological response units (HRU's) retrieved from the Soil and Water Assessment Tool (SWAT) database. The prototype program has a graphical user interface that shows the current status of a simulation.

Database Support

- The database schema for a database that stores the data needed by Surface Irrigation Soil Loss (SISL), Soil Conditioning Index (SCI), and Soil & Water Assessment Tool (SWAT) has been designed. The database is expected to contain 30 to 50 tables. Therefore, it is not practical to create forms manually for this database. The intent is to use the software tool being developed to generate web-forms that support such basic database operations as insertion, deletion, selection, and updating.
- The research technician that will manage farm survey data collection and decision aid results validation has been hired and will begin work the first week of October. The RCD, ARS, the research technician, and local farm advocacy groups will develop a strategy to enlist farmer support and participation in the survey.

Future Work

- The Web-based RUSLE I will be completed in a few months. Then work will begin on Web-based RUSLE II or WEPP, as specific applications for the resource management needs of Yolo County. Other applications that will be placed on the web are the Surface Irrigation Soil Loss (SISL), SCI, and phosphorus index (P-index). USDA-NRCS is beta testing the ProCosts budget generator that will be assessed and its functions will be implemented with our data base.
- The research technician to manage farm survey data collection and decision aid results validation has been hired and will begin work the first week of October. A strategy to enlist broad farmer support and participation in the survey will be developed with the Yolo County RCD and farm advocacy groups.

Problems or Delays Encountered

No significant problems or delays have been encountered with this task.

Other Issues or Comments

There are no other issues or comments.

Tasks 3 and 5--First Year Fall/Winter (2001-02) and Spring/Summer (2002) Program Management and Communication

Program Management and Administration
This task includes overall program management and administration, reporting and invoicing, and coordination between project partners, cooperators and subcontractors. It also includes communication with, and outreach to watershed residents, the agricultural community, regional schools, agency personnel, CALFED, and the general public.

The work within this Task includes a whole host of start-up and ongoing activities. The RCD Executive Director (ED) spent the initial months of the Project working closely with our National Fish and Wildlife Foundation (NFWF) Grant Manager to successfully complete the contract/sub-contract phase. We initiated watershed-wide landowner contact, as discussed in the Introductory Narrative and ordered the samplers and other field equipment. We held initial meetings with our Partners to plan and coordinate the upcoming years' work both in the field and on the OnePlan. We continue this coordination on an ongoing basis. The ED is the primary coordinator for the RCD components of development of the OnePlan. The LUSSWIP Project manager has completed CALFED's required administrative documents, such as providing an EMP and QAPP (written by the USDA ARS), writing Quarterly Reports, monthly reports to our Board of Directors, and completing invoices in the required format, in a timely fashion. She has worked closely with the Executive Director in the completion of other administrative tasks such as hiring interns for project support and working with subcontractors. Along with these specific tasks, she has provided ongoing organization, supervision, and coordination of all project personnel and activities.

Communication
Our Watershed Outreach Coordinator (WEC) has focused on activities and projects that promote the LUSSWIP Program and provide either new educational materials, or ongoing updates on our activities. She has developed connections with local and regional education programs, including local schools, the SLEWS Program mentioned under Tasks 1 & 4 above, which serves as our local "Adopt-a-Watershed" Program, and community watershed groups within the District. In the Appendix, we have included a number of examples of the materials and activities under this Task. Some of these are discussed further here.

The Field Day Series flier illustrates the topics covered during our two-hour workshops. During these workshops we provide 'take-home' materials appropriate to the topic, often including copies of articles from our book "Bring Farm Edges Back to Life" (one hard copy provided to NFWF with this report). The workshops attendees evaluated each workshop and feedback was very positive. Sample evaluation forms can be seen in the Appendix. Feedback on the Field Meetings was overwhelmingly positive, with nearly 100% of attendees reporting that their expectations were met or exceeded. The workshops are conducted at specific conservation project sites and with presentations by the landowner because attendees place a high value on these. We have already planned new landowner workshops for the coming winter months.

The WEC helped to update our tabletop display to include the LUSSWIP Program (photo provided). This display has been used at numerous events, including Duck Days, a regional wetlands and conservation festival, where the Junior Conservationist Badge could be earned (kids worksheet provided), Weed Management Area and other professional meetings. We have created a new LUSSWIP Project web-pate, with dedicated and related articles and links. We have had numerous articles printed in local and regional newspapers and the WEC has produced two Service Center newsletters. The "Service Center includes the joined offices of the USDA-Farm Service Agency, USDA-Natural Resources Conservation Service, and the Yolo County Resource Conservation District. We have also produced two new topic area brochures, "Watersheds of Yolo County" and "Sediment Traps," and two landowner profiles, which will be used to familiarize other landowners with the conservation attitudes and approaches of their peers. Please see the newspaper articles, newsletters and brochures in the Appendix. Overall, the RCD has exposed a wide range of audiences – landowners, school children, the general public - to our new watershed program and to the conservation message in general.

Verbal or Written Presentations:

- The NFWF Contract Manager has requested the first site visit and tour. This has been arranged for October 16, 2002.
- The RCD Executive Director (ED), Paul Robins, and Jeff Steiner, USDA ARS, made a presentation to the State of California Department of Pesticide (DPR) July 15, explaining the Lower Union School Slough Watershed Improvement Program and all of its components.
- Similar presentations were made to the Weed Management Area that same day and to the US Bureau of Reclamation on July 9.
- Dr. Steve Griffith, USDA ARS, and the Paul Robins participated at the Conservation Tillage 2002 Conference sponsored by the University of California at Davis, on September 17, 2002. During the conference approximately 100 persons, comprised of farmers, extension agents, and scientists, visited the CALFED on-farm research site where information was exchanged by Dr. Griffith and the RCD ED about conservation and conventional tillage systems and the CALFED on-farm research project. A reporter from *Ag Alert,* a California agriculture news publication documented the event.

Cost-Share/In-Kind

- USDA ARS cost share for the first year of the project includes $96,480 in salaries for scientists, technicians and part time labor, and $65,515 in travel, supplies and equipment, for a total of $347,919.
- Yolo County RCD cost share from a variety of UC professionals, UC Researchers and staff, USDA NRCS State and Field Office staff, Yolo County staff, landowners, and partners totals $42,520. A listing of Cost-share is provided in the Appendix.

Problems or Delays Encountered

No significant problems or delays have been encountered with this task.

Other Issues or Comments

There are no other issues or comments.